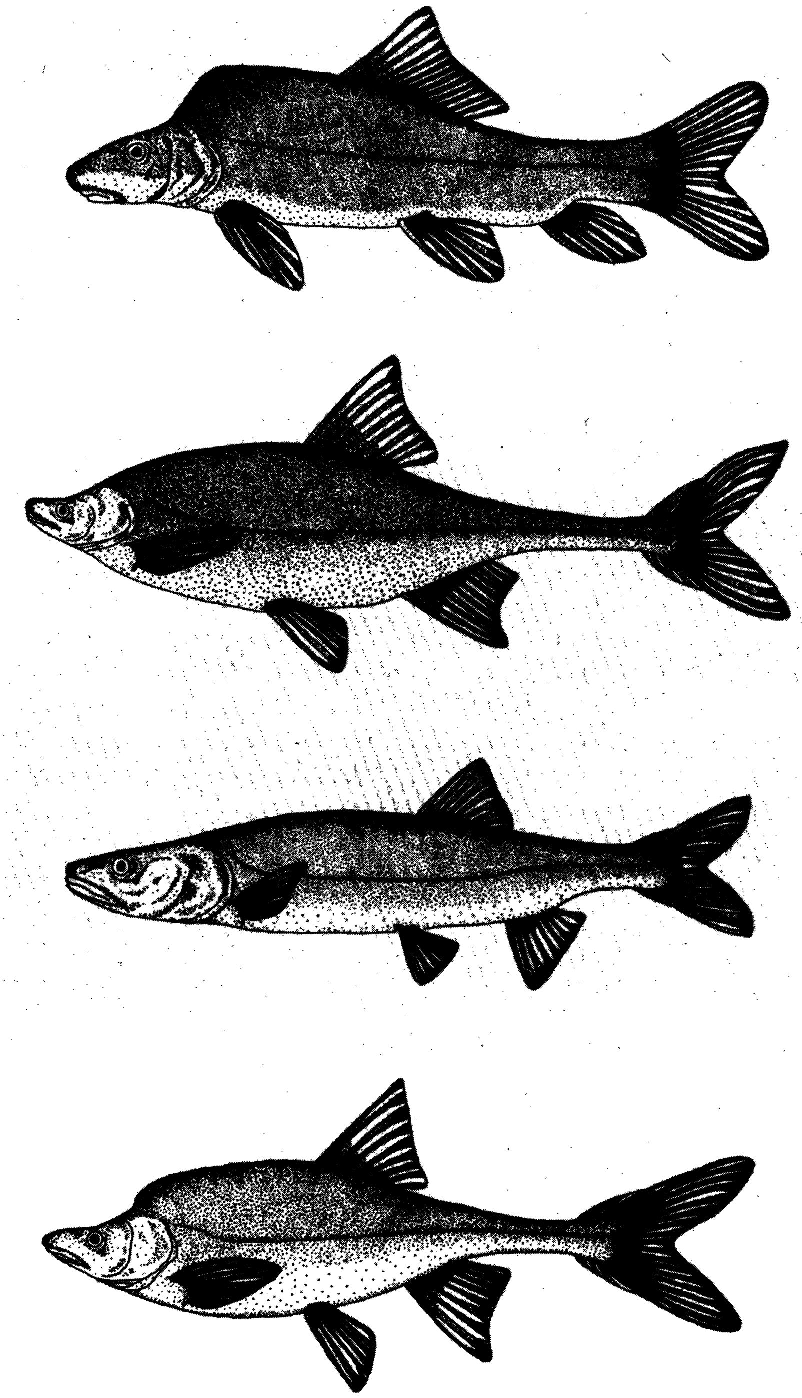
Endangered Species UPDATE

Including a Reprint of the latest USFWS Endangered Species Technical Bulletin

March/April 1992 Vol. 9 No. 5 & 6

THE UNIVERSITY OF MICHIGAN
School of Natural Resources



In this Issue

Razorback Sucker Listed as Endangered: A Further Decline in the Colorado River System

by
Harold M. Tyus

INTRODUCTION

On October 23, 1991, the razorback sucker *Xyrauchen texanus*, an endemic Colorado River fish, was listed as an endangered species by the U.S. Fish and Wildlife Service (USFWS 1991). This fish was formerly abundant throughout the mainstream rivers of the Colorado River basin (reviewed by Minckley et al. 1991) and was used as food by native Americans and settlers. Its listing as an endangered species was justified because of low numbers, little or no recruitment, and habitat change caused by diversion and depletion of water, construction and operations of dams, and interactions with introduced fishes (USFWS 1991). Although this fish has been proposed for listing in the past, it now officially joins other native Colorado River fishes, including Colorado squawfish *Ptychocheilus lucius*, humpback chub *Gila cypha*, and bonytail *Gila elegans*, that once ranged mainstream rivers of the Colorado River basin from Wyoming to Mexico. All of these fishes, and several others in the basin are threatened with extinction, an indication of the precarious status of the native freshwater fauna in the Colorado River and southwestern United States. (Carlson and Muth 1989, Minckley and Deacon 1991).

Endangerment of the razorback sucker is no surprise given the declines in species and population abundance of native North American fishes. During the past 100 years, 3 genera, 27 species and 13 subspecies of fishes have become extinct, and an additional 364 rare fishes are threatened (Williams et al. 1989). Stream fishes have been especially affected, and it is unknown whether the rate of this loss can be reduced. The fate of native fishes in the American Southwest is of particular concern, due to widespread and drastic habitat loss (Minckley and Deacon 1991).

The Colorado River basin comprises about 12% of the land mass of the continental United States. Because the basin is located in an extremely arid climate, its waters are a precious and exploited commodity (Fradkin 1981; Carlson and Muth 1989). Construction of large mainstream projects began in the early 1900s (Fradkin 1981; Carlson and Muth 1989), and by the 1960s, much of the mainstream Colorado River had been converted into a system of dams and diversions. As a result, the timing, duration, and magnitude of flows of most rivers of the basin have been substantially altered. The decline of native species and proliferation of non-native fishes introduced by man (Minckley 1982; Tyus et al. 1982; Carlson and Muth 1989) were associated with these changed habitats. In some instances, changes have ostensibly occurred too quickly for native forms to adapt and recover (Minckley and Deacon 1991; Molles 1980).

COLORADO RIVER FISHES

Decline and Current Status

Geographic isolation and extreme climatic conditions resulted in a unique Colorado River fish fauna (Miller 1959, 1961; Molles 1980). This fauna can be separated into three categories: (1) fishes that inhabit high or intermediate elevations that either share, or have closely allied forms in adjacent drainages, (2) endemic species of small streams at low to intermediate elevations, and (3) big river fishes, commonly called the Colorado River fishes, which are mostly endemic species of mainstream rivers (Minckley et al. 1986). Native big river fishes, consisted only of cyprinids (minnows) and catostomids (suckers), that were widely distributed in mainstream habitats of the historic Colorado River basin (Jordan and Evermann 1896). The range and abundance of four of these fishes, Colorado squawfish, humpback and bonytail chubs, and razorback sucker, have been so drastically reduced that they are now threatened with extinction.

In the Lower Colorado River, change in natural flow regimes, stream blockage, and conversion of many miles of warmwater stream habitat to reservoirs and cold tailwaters have extirpated native fishes in much of the mainstream. They have been replaced by a new fauna of about 44 forms (Minckley 1982), many of which were introduced from more mesic environments. Of these, 20 species are abundant either locally or regionally. About 80% of the native fishes there are endangered (W.L. Minckley, personal communication). Colorado squawfish has been extirpated from the lower Colorado River; relict populations of bonytail and razorback sucker remain in some impoundments but neither species are presumed self-sustaining; and humpback chub reproduction in the Grand Canyon is restricted to the Little Colorado River. The range of other native fishes, including the flannelmouth sucker (C. latipinnis), has also been reduced.

Colorado River fishes are more widespread in the upper Colorado River basin, where about 2000 km of occupied habitat remains in mainstream rivers (Tyus et al. 1982). The native fish fauna there includes six species that are endemic large river cyprinids and catostomids, and six headwater forms that also occur elsewhere. Forty-two introduced fishes are presently reported, and about 10 are considered abundant (Tyus et al. 1982). Colorado squawfish persists in the Yampa River, the Green River below its confluence with the Yampa River, the upper Colorado River mainstream, and the lower San Juan River. The humpback chub is reproducing successfully in the Yampa and upper Colorado rivers. The razorback sucker persists in the lower Yampa and Green rivers, the mainstream Colorado River, and the lower San Juan River, but there is no indication of recent recruitment in these remnant populations (USFWS 1991). The remaining endangered large river fish, the bonytail, is extremely rare, and may be extirpated from the upper Colorado River basin.

Prognosis

Recovery of listed species. Some management practices that would promote recovery of native Colorado River fishes have been suggested, but remain unproven. Such practices can only be determined effective by testing populations of Colorado River fishes under various flow/habitat scenarios. Of first consideration is provision and maintenance of instream flows of the proper quality, timing, duration, and magnitude. These flows must be delivered to the proper locations to satisfy the life history requirements of the various fishes. The attainment of sufficient quantities of water requires determination of instream flow needs so that water can be provided, acquired, or appropriated. However, flows needed for the fishes may potentially affect water resources allocations on a local level, and also among and between: the United States, Mexico, and the states of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. Thus, flow provisions for the fishes will be difficult to accomplish if these flow allocations depart from current practices.

Efforts have been made to maintain captive brood stocks of the listed fishes to provide animals for reintroduction. However, fish culture was developed to support or restore sport fishing opportunities for only a few species; not recovery of endangered fishes. Thus, there are many research needs that remain to be answered regarding the use of hatcheries and stocking programs in management of endangered fishes. Without habitat maintenance or improvement, hatcheries provide temporary refuges for genetic material and research facilities for laboratory studies. Fish stocking programs can benefit management for recovery, but only in coordination with a comprehensive program in which life requirements of target species are well understood, and these requirements provided. If habitats have not improved, reintroduction of fishes into them should be considered only a stop-gap measure (Rinne et al. 1986). Thus, the existence of hatchery stocks of various Colorado River fishes does not, in of itself ensure recovery (even if broodfish can be kept alive— not an easy task for wild animals that may have to be transported many miles to a proper facility).

Management efforts may assist recovery of listed Colorado River fishes, but most management practices in the Colorado River have involved introductions of non-native sport fishes into habitats occupied by native fishes. Such stockings began in the late 1800s, and competition of these non- natives with the endangered fishes has been proposed by various workers (reviewed by Minckley and Deacon 1991). Direct effects of such introductions on native fishes may include: Elimination, reduced growth and survival, and changes in community structure (Moyle et al. 1986).

It is evident from the above, that recovery of endangered Colorado River fishes will require programs based on well-organized and applied research to develop and test management-related hypotheses. Although past survey efforts were sorely needed to obtain baseline information, there is a need to focus on hypothesis-solving research to address, and hopefully answer some of the complex questions pertaining to recovery of these fishes. In addition, a lack of published information in accessible journals has been cited as a problem that has hindered recovery efforts (Minckley et al. 1991).

Decline of other species. To date, almost all of the interest in determining habitat requirements of, and conserving Colorado River fishes has been associated with the need to protect federally-listed endangered species. However, the "fundamentally insular" (Molles 1980) nature of the fauna suggests that other species may also become endangered or extinct in the near future. As each species disappears, it is anticipated that recovery of the remaining forms will become increasingly more difficult as perturbations in the native ecosystem

Endangered Species UPDATE

A forum for information exchange on endangered species issues
March/April 1992
Vol. 9 No. 5 & 6

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Readers include a broad range of professionals in both scientific and policy fields. Articles should be written in an easily understandable style for a knowledgeable audience. Manuscripts should be 10-12 double-spaced typed pages. For further information, contact the editors at the number listed below.

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Endangered Species UPDATE
School of Natural Resources
The University of Michigan
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Cover:
Endangered Colorado River System Fish: Razorback sucker, bonytail, Colorado squawfish, and humpback chub.
Drawn by J. M. Beard.

Production of this issue was made possible in part by support from the Chevron Corporation.

increase. An example is the flannelmouth sucker, although previously reported from a variety of locations in the lower basin, the fish has now been extirpated south of Lake Mead (W.L. Minckley, personal communication). Other fishes, including the roundtail chub (*G. robusta*) are uncommon-to-rare in many mainstream habitats in the upper Colorado River basin (Tyus et al. 1982). Although some non-endangered fishes have been studied, this is mostly incidental information obtained during studies of the listed fishes. To date, study of the former has been constrained by lack of funds and lack of interest. This trend is expected to continue.

CONCLUSIONS

Endangerment and ultimate loss of the native Colorado River fish fauna remains a possibility. If lost, it would be the loss of the most endemic riverine ecosystem in North America (Miller 1959). Unfortunately, failure to preserve endemic Colorado River fishes would perhaps foretell the doom of many other systems of the world as well. If the lower Colorado River basin is indeed a model that predicts the outcome of water resources development and introduction of non-native competitors on the upper basin (Molles 1980), the future outcome appears grim. However, there is some hope. The loss of species was not a national concern until recently, as evidenced by the passage of the ESA less than 20 years ago. It was due to this act, and the intensive efforts that it sparked, that much is known about the ecological requirements of native Colorado River fishes. Hopefully, these efforts will continue, and the future outcomes be enhanced by the information already obtained.

On the other hand, endangerment of native Colorado River fishes continues. Although a Recovery Implementation Program has been developed for them (Rose and Hamill 1988) effective management practices have not yet been demonstrated, nor have endangered fishes been recovered. To do so will require many years of costly and intensive research and management work. This can only be accomplished by efforts of many agencies and individuals, many of whom will have conflicting goals. It is the cooperation of various agencies that are charged with protection of the fishes and management of the water upon which they depend, that will permit the development and testing of management procedures and practices for recovery of listed fishes; presumably to the benefit of the entire native fish fauna. If this is not successful, it is doubtful that many of the native Colorado River fishes will survive in nature.

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Harold M. Tyus is a biologist with the U.S. Fish and Wildlife Service in Denver, Colorado, and an expert on Colorado river fishes.

Note: For further reading on Colorado River Fishes we recommend the book: Battle Against Extinction: Native Fish Management in the American West, by W. L. Minckley and J. E. Deacon, Editors. 1991. Univ. of Arizona Press. A review of this book is forthcoming in ESU.

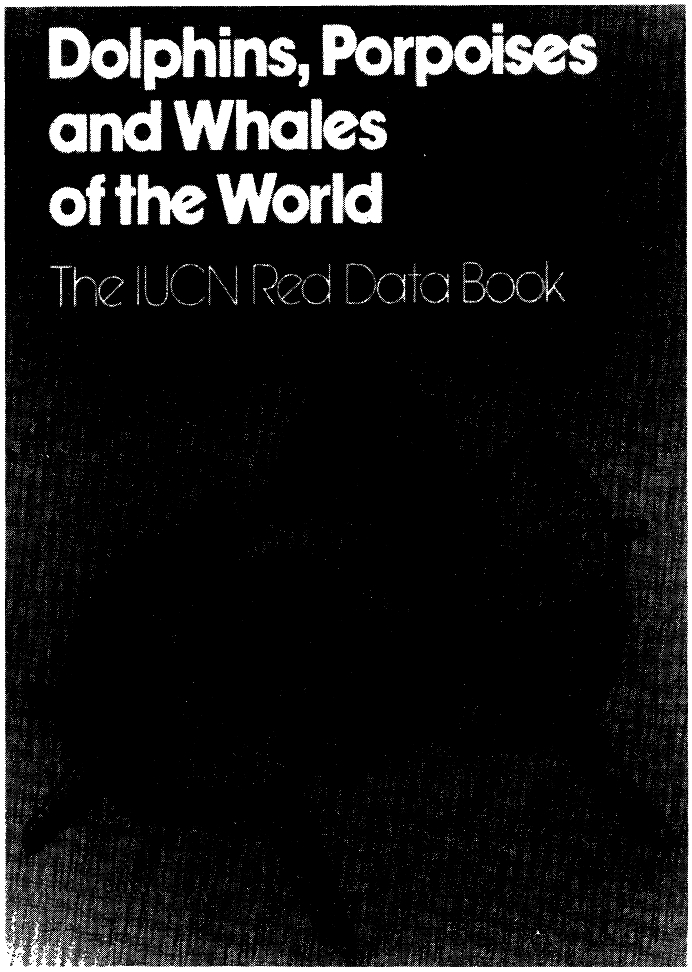
Book Review

Dolphins, Porpoises and Whales of the World: The IUCN Red Data Book. 1991. Cambridge

by The IUCN Species Survival Commission and The World Conservation Monitoring Centre

This book is a very useful reference. Compiled by Margaret Klinowska, it is intended to complement the IUCN species Survival Commission Cetacean Specialist Group's publication of the *Action Plan for Conservation of Dolphins, Porpoises and Whales: 1988-1992* (Perrin 1989). The Action Plan proposes activities required to protect a number of the most critically endangered cetacean species from extinction. This volume provides brief entries reviewing the background and current status of each of 80 species, including both mysticete (baleen whales) and odontocete (toothed whales) cetaceans. Each species is assigned to one of the 7 standard Red Data Book categories (extinct, endangered, vulnerable, rare, indeterminate, insufficiently known, out of danger). Justin Cook provides a useful discussion of the problems with these classifications, particularly for classifying cetaceans, along with a very cursory overview of the biology and conservation problems of cetaceans in the introductory chapters.

Each species entry is subdivided into 7 sections, beginning with a short **summary** of the conservation status of the species, then a section describing the **geographic distribution** of the species, both historically and currently where information is available. For species with restricted ranges, i.e. the riverine dolphins, maps are provided, in some cases showing the locations of major dams. The next section, **population**, provides a review of information available on estimates of population sizes for the species, although good estimates are rarely available. A section on the **habitat and ecology** of the species provided information about basic parameters such as lengths, maximum ages, gestation periods, and dietary habits. The next section discusses **threats** to the species, with brief discussion of the most significant problems faced by the species, including estimates of the numbers of animals taken incidentally in gill nets or in direct fisheries for consumption, major threats to habitat quality including damming (for riverine species), pollutants, etc. The next section, **conservation measures**, begins with a listing of the countries of origin for such measures, the species' CITIES listing, and an account of international trade in the species (based on records from 1976-1985). The rest of this section discusses specific measures needed for protection of the species, including research priorities and the establishment of preserves. Finally, a section entitled **captive breeding** describes previous attempts at maintaining the species in captivity, and, in most cases, points out the need for research into husbandry practices. References are provided for each species entry.



Although the book provides nice summaries of available information for each species, our current state of knowledge about most cetacean species is meagre. The usefulness of the book therefore often lies more in pointing out what is not known and what needs to be done, rather than providing a satisfying overview of the biology and conservation of any given species. For the 80 species addressed in this volume, 65 are classified as "insufficiently known." This lack of information is nerve-wracking for those concerned with the protection of cetacean species. In some cases, it is unlikely that we will ever be able to obtain the kinds of information needed for management decisions. For example, obtaining reliable estimates of population sizes is extremely difficult, particularly for the more pelagic species. All of the riverine dolphins are clearly in need of immediate protective measures (only about 300 Chinese river dolphins *Lipotes vexillifer*, remain in the Yangtze River, for example). In many cases, we simply do not have the luxury of waiting until research into the biology of a species is completed prior to taking measures to protect them from the threat of extinction. Developing management strategies for these poorly understood species will certainly be challenging.

Reviewed by Rachel Smolker, Doctoral student in the Department of Psychology at the University of Michigan, Ann Arbor, MI 48019-1054.

Conserving Biodiversity in the Real World: Professional Practice Using a Policy Orientation

by

Tim W. Clark, Peter Schuyler, Tim Donnay, Peyton Curlee, Timothy Sullivan, Margaret Cymerys, Lili Sheeline, Richard Reading, Richard Wallace, Ted Kennedy, Jr., Arnald Marcer-Batlle, and Yance De Fretes

The unifying goal of conservation biology is the preservation of biological diversity through the maintenance of viable ecosystems. Even though there is general agreement about the paramount goal, there is debate among its practitioners as to the scope of acceptable professional practice. We believe that a "policy orientation" can complement rigorous scientific methods and is essential for achieving many conservation aims. Furthermore, scientific professionalism need not be sacrificed. We briefly examine the elements of the biodiversity conservation challenge and how professionals can better meet this challenge with a "policy orientation" that we introduce. Unfortunately, most university programs provide few opportunities for future professionals to learn what a "policy orientation" is, much less how to apply it responsibly and practically to benefit biodiversity conservation efforts.

The Biodiversity Conservation Challenge

Conservation biology is a "mission-oriented crisis discipline" (Soulé 1986:3) that exists to address the challenge posed by the loss of biological diversity. Few would debate the ultimate aims of conservation biology, but what is less clear to professional conservation biologists is their specific role in meeting this challenge. The loss of biological diversity has multiple causes and efforts to redress losses will require contributions from many disciplines. One approach conservation biologists have adopted is to use scientific methods to provide information useful to natural resource managers or decision-makers. This approach uses tools such as field surveys, population viability assessments, and analyses of preserve design and management. Some conservation biologists are apt to accept the view that production of useful biological knowledge is the only goal of their profession. While we accept that good science must remain at the core of conservation biology and that there should be limits to the sort of advocacy a scientist pursues, it is a practical mistake to limit the training and experience of conservation biologists to scientific fields only.

Few would deny that the ultimate causes of biological impoverishment are social, political, and economic in nature. Conservation biology, however, should not be about directly changing the social forces that are causing our environmental problems. Murphy (1990) is right when he concluded that conservation biology should be about providing the scientific information necessary to correct the problems leading to the loss of biological diversity. But we need to recognize that the process of correcting biological problems takes place in the same social and political arena as the processes that are driving environmental degradation in the first place. If conservation biologists are to be effective in promoting solutions to environmental problems, they must understand the non-biological factors behind environmental change and be willing and able to participate effectively and offer solutions in the arenas where social change occurs. Providing the scientific information to guide policy, and not "just provoke it" (Pool 1990:673), is necessary for real conservation actions. Hales (1987:81) identified one aspect of the problem in noting that the "trained, analytical approach of the biologist, or any other disciplinarian, often seems to lead to fragmented problem definitions and unimaginative solutions, the success of which, over time, is not particularly impressive."

An alternative, and we argue more effective, way for conservation biologists to approach the challenge posed by the loss of biological diversity is to understand the policy process well enough to maximize opportunities so that science based recommendations are applied. It is at this level that a policy orientation to conservation biology, particularly when the policy sciences are taught along with the biological sciences in a comprehensive university training program, can be most helpful. In discussing the weaknesses of endangered species recovery programs, Clark (1989:3) states:

> Most descriptions of endangered species recovery focus only on the biology of the species, thus creating the unrealistic view that conservation and recovery are strictly technical, biological tasks. In fact, numerous non-biological factors and forces have direct, immediate and paramount significance to endangered species recovery, and if the conservation movement is to be effective, it must explicitly recognize the interactive impacts and contributions of all the various dimensions.

For conservation biologists to be successful, they must become more proficient at understanding the processes that drive environmental degradation and at providing remedial strategies and tactics. Accepting this premise still leaves some questions as to the scope of acceptable professional practice for conservation biologists. Conservation biologists are and must remain above all else scientists; applying scientific methods to conservation questions. Systematic, rational, fact-theory driven, experimental, and "objective" science is a must. However, if experience or knowledge of the policy process makes conservation biologists more effective, how much farther should they go? As Orr (1990:9) asked, "how should those calling themselves conservation biologists deal with politics and the question of management in their research, writing and teaching?" If knowledge of the policy process is valuable, how should it be incorporated into training programs for conservation biologists?

The Professional Challenge: A Problem of Definition?

The limitations of traditional wildlife management programs and "normal science" (see Kuhn 1970) that promote narrow, "technical," "fix-it" approaches, and their failure to encompass the biodiversity conservation challenge, have been outlined by Clark (1986, 1988), Norton (1988), Orr (1990, 1991) and others. More recently, Soulé (1990:1) observed that "solutions to environmental problems have as much to do with politics and perceptions as with biological fact...when it comes to influencing public policy, we will need political as well as research skills." Yet, the question remains, where should the science of conservation biology end and the advocacy of other constituencies begin? Should conservation biology assume itself to be a "value-free" science, merely providing information to resource and political managers? Or do conservation biologists have an obligation to "participate with the public in a debate regarding the very nature of ecological health, even while trying to protect it?" (Norton 1988:238).

A growing number of authors have suggested that conservation biologists need to become more proficient at understanding, participating in, and anticipating policy processes. Firstly, Noss (1989) concluded that effective conservation biologists must walk the narrow line between science and policy-making and address concerns raised by both. Secondly, Carr (1987:86) observed that good conservation biologists should be "willing to use their training and analytical skills beyond the confines of biology, reaching out to examine the cultural or sociological factors that bear on the survival of their favorite species." Thirdly, Maguire (1990:125) recently presented a scheme to guide conservation biologists towards responsible advocacy, by using risk analysis to assess management options and illuminate "the consequences of silence and inaction" should traditional scientific conservatism prevail.

Can conservation biologists actually play an effective role beyond the confines of biology without sacrificing their effectiveness and credibility as scientists? Can both capabilities exist in the same individual professional? We believe the answer is "yes" — a professional can be expert in scientific pursuits and at the same time possess an explicit orientation to the policy process.

How Can a Policy Orientation Help Professional Conservation Biologists?

We all know of instances where good scientific knowledge has been ignored, dismissed, misapplied, or only partially used by decision and policy makers (see, for example, Snyder 1986). If conservation biologists are to make greater conservation gains, they must facilitate the integration of decision and policy processes with reliable information. The way a scientist presents data and interacts with decision makers and the public may very well make the difference between the success or failure of a conservation program. The stakes are high when extinction of species or the loss of biological communities can result from inappropriate decisions and policies. Conservation biologists, therefore, must produce reliable knowledge through research and participate in the socio-political context in which that knowledge is used.

The term "policy orientation" was coined by Harold Lasswell (1951). "Policy" is a broad strategic intent to accomplish a goal (Brewer and deLeon 1983); the aim here being the conservation of biodiversity. "Orientation" reflects a direction or the relationship of an idea or concept to the dynamic policy process. Having a policy orientation means having knowledge that is directly useful *in* the policy process as well as having knowledge *of* the process itself (Lasswell 1971). Therefore, conservation biologists must have two kinds of knowledge. First, the biological skills to generate basic and applied knowledge; and second, the social science skills to encourage the wise use of scientific knowledge by policy makers.

The policy sciences study decision and policy processes, using both experimental hard science and observations or experience in order to determine how these processes work independent of their reliance upon technical knowledge (see Lasswell 1971). The term policy sciences

> is not another way of talking about the 'social sciences' as a whole, or of the 'social and psychological sciences.' Nor are the 'policy sciences' identical with 'applied social sciences' or 'applied social and psychological sciences'... Nor are the 'policy sciences' to be thought of as largely identical with what is studied by the 'political scientists' (Lasswell 1951:3).

Policy scientists are problem-oriented, focused on defining and solving real-world problems (Brewer and deLeon 1983). They use a variety of tools to understand the context of a problem as completely as possible; examining its history and trends, explaining the trends, projecting the trends into the future, evaluating the trends, and inventing and selecting alternative solutions. Policy scientists' problem-solving approaches are not reductionistic or "positivistic" (see Brunner 1988, Norton 1988, Clark In Press), in the sense that discipline-based biological science and even much of conservation biology tends to be. It is beyond the scope of this small paper to develop this observation and contrast the problem-solving approaches of the policy and conservation sciences. The policy sciences are a fundamentally different way of thinking in contrast to traditional science; they are a way of thinking, in the sense that logic is a way of thinking . Norton (1988) adequately outlined the limitations and failures of scientific positivism as a philosophy for problem-solving and the need for a new post-positivistic philosophy. Even if a conservation biologist possesses only a little policy science knowledge or a few of its problem-solving skills, it might make a considerable difference in constructively influencing the pertinent decision and policy processes.

Having a useful "map" of the policy process is essential for a policy orientation. Just as there are models of ecological systems, there are also models of policy processes. These models can aid in practical applied conservation by revealing the many aspects of a problem's setting and useful paths of action. The models can direct one's intellectual attention and highlight areas where information is lacking (Brewer and deLeon 1983). People adept in the policy process have been likened to expert, general problem solvers (Lasswell 1971, Buffington 1989). A conservation biologist, expert in science, can also be expert in general problem solving without compromising his or her scientific standing. The practitioners' primary interest may be conservation science, for example, but they should also have an interest in the decision and policy processes that use their science. If such biologists are viewed to be outside the bounds of accepted professional practice, then perhaps the bounds need to be redefined.

The best model of the policy processes that we know of was developed by Brewer and deLeon (1983), based on Lasswell (1971), and describes the six phases through which nearly all policies or programs pass. They are: problem identification (initiation); expert analysis and technical considerations (estimation); policy formulation, debate, and authorization (selection); specification and application (implementation); ex-post appraisal (evaluation); and discontinuation or revision of the policy or program (termination). Each of these phases can be very complex, but there are recurring characteristics and weaknesses in each phase regardless of the specifics of the case (Ascher and Healy 1990). Examples of weaknesses in several phases of conservation programs have been described in Kohm (1991). If a conservation biologist is knowledgeable about these phases and what is likely to happen in each, then he or she is in a position to influence outcomes of decisions and policies and aid biodiversity conservation. We readily acknowledge, however, that not all decision and policy processes are accessible for improvements.

The Brewer and deLeon (1983) policy process model was modified and expanded in 1988 (Clark and Kellert 1988, Kellert and Clark 1991) to fit more explicitly the needs of people interested in the conservation of biodiversity and management of wildlife resources. This modified model employs the same six phases and identifies four classes of "factors or forces" that make up the policy dynamic: biophysical (physical properties of the resource), valuational (human values about the resource), social-structural (property rights and access to the resource), and institutional-regulatory (organizations and their directives).

More conservation biologists now recognize the need for a policy orientation in their professional practice, but not all authors refer to it by that label. Three illustrations of this point follow. Lovejoy (1989:329) noted that "An awareness of this public role [of conservation biologists], whether sought by ourselves or thrust upon us uninvited, is essential. We do not help either science or society by evading our social responsibility as experts." Deskmukh (1989:321) concluded that: "As conservation biologists we can help decide what to conserve and where, within a policy framework that we should help to formulate." Lastly, Clark and Kellert (1988:7) noted that if the field of conservation science

> is to contribute fully and adequately to the critical societal decisions affecting the future abundance and well-being of our nation's flora and fauna, then it seems essential that young wildlife professionals be sufficiently educated in the complexities, subtleties and techniques of the policy process.

The training programs for conservation biologists could benefit from broadening the scope of what they teach to incorporate a policy orientation to conservation.

Professionals and the Future

In addition to the obvious need for good science education, there is growing recognition that university conservation biology programs should teach an explicit policy orientation. Professional conservation biologists educated with a policy orientation can be expected to be more effective in achieving conservation aims.

A policy orientation can be introduced at an undergraduate level, but is most effective in Master's and Ph.D. programs, after students have had some "real" world working experience. Beissinger (1990:457) calls for an expanded course requirement for conservation biologists to incorporate disciplines outside the traditional departments, and recommends that "Conservation biology may best be taught at the master's level, where breadth of knowledge, scientific methodology, and problem-solving skills can be emphasized..." We assert here that an essential problem-solving skill that should be taught is a policy orientation involving explicit, practical, applied knowledge of the policy sciences. With a policy orientation as introduced above, conservation biologists should be able to communicate and participate within the public policy dynamic with enhanced creativity and leverage applied to our common goal of preserving biodiversity.

Space precludes a complete description of a sample course that teaches a policy orientation. Our experience in a graduate-level course at Yale University's School of Forestry and Environmental Studies offers one example. Our course was titled: "Species and ecosystem conservation: developing and applying a policy orientation." It sought to educate conservation biology students about the professional, institutional, and policy settings in which they are likely to work. The course surveyed a range of policy and organizational theories, techniques, and contexts using exercises and national and international case studies. It examined the policy sciences, as well as the conservation sciences, in some detail and applied its problem-solving concepts and tools to various species and ecosystem conservation challenges. It included a survey of techniques, such as population viability assessment and geographic inventory systems, and how these are used in decision and policy processes. Perhaps the greatest value of the course came from examining cases where good traditional science had failed to lead to effective conservation actions. By explicitly recognizing the limits of science to produce desired results, students were forced to explore and learn about other skills and perspectives that promise to make future biodiversity management efforts more effective.

Our course at Yale is just one example of how a policy orientation can be incorporated into a training program for scientists. We encourage students and faculty associated with similar programs to reach out to colleagues in other disciplines, notably economics, sociology, and political science which share similar interests in conservation and wise management of natural resources. They should collaborate with them in transdisciplinary efforts to examine how conservation biology can be made more effective.

Conclusions

Given the urgent threats to biodiversity, it is crucial that conservation scientists, managers, administrators, policymakers, and others be as effective as possible. As "the relationship between people and the biological resources upon which their welfare depends" changes (McNeely et al. 1990:16), new methods of addressing conservation issues are required. This changing relationship and its consequences are being appreciated in various ways. For example, Gorbachev (1990:33) said: the "greening of politics is an affirmation of the priority of values common to humanity...and [the development of] a new and contemporary attitude toward nature." An example, on a modest scale, is the origin of the profession of conservation biology. The leadership and professional activities of conservation biologists have much to offer in these uncertain times of extraordinary global environmental change. Nevertheless, we should constantly question how professional conservation biologists can be most effective in meeting the overall biodiversity conservation challenge and bringing about Gorbachev's "new contemporary attitude toward nature." We are convinced that knowledge of how to apply a policy orientation can significantly improve professional effectiveness.

Acknowledgments

Steve Beissinger, Steve Kellert, Dennis Murphy, and three anonymous reviewers critically reviewed the manuscript.

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Tim W. Clark is President of the Northern Rockies Conservation Cooperative and Adjunct Professor at the Yale School of Forestry and Environmental Studies, New Haven, CT 06511. The remaining authors participated in the Yale experimental course on conservation biology with a policy orientation described in this article.

ESA Amendments: The Good, the Bad, and the Unnecessary

by Pamela Pride Eaton

The renewal of the Endangered Species Act (ESA) is shaping up to be a showdown. Already, numerous amendments have been proposed to both strengthen and weaken the Act. As the list of proposed amendments grows, it will become increasingly difficult for members of Congress, the media, and the public to differentiate between those changes that will improve the effectiveness of the Act and those that will frustrate it. This article is intended to be a first primer on the good, the bad, and the just plain unnecessary.

Black Hats Ride Again

Some proposed amendments to the ESA are simply the same old horse ridden by Interior Secretary James Watt in the early 1980s. Two bills already introduced in Congress would require that actions taken to protect endangered species be weighed only in terms of **economic** costs and benefits. "The Human Protection Act of 1991" (H.R. 3092) sponsored by Representative Jim Hansen (R-UT), and "The Balanced Economic and Environmental Priorities Act of 1991" or "BEEP" (H.R. 4058), sponsored by Representative Dannemeyer (R-CA) would make listing, designation of critical habitat, and other actions to save species subject to a determination that the economic benefits of conserving the species outweigh the costs. A similar provision implemented by the Reagan administration in the early 1980s crippled the Act by preventing species from being added to the endangered species list; it took an amendment in 1982 to get the listing process back on track.

Not all proposed changes to the ESA have been formally introduced as amendments. At an April 10, 1992 hearing on the ESA before the Senate Subcommittee on Environmental Protection, the Act's opponents expressed interest in eliminating protection for subspecies and populations. A western senator asked why we should rescue sockeye salmon stocks in the Pacific Northwest when residents there can buy sockeye from Alaska at the grocery store. A cattleman who runs his cattle on federal public land told the Senate Committee that grizzly bears are his worst nightmare. In his opinion grizzlies need not be protected in the Rocky Mountains since they are abundant in Canada and Alaska.

Heros and Friends

The (Key) deer and the (Sonoran) antelope do have their heros, however. Last November, Gerry Studds (D-MA), Chairman of the House Subcommittee on Fisheries and Wildlife Conservation, introduced "The Endangered Species Act Amendments of 1992" (H.R. 4045), with the support of 30 other members of Congress. Cosponsorship now tops 70. Among other things, H.R. 4045 addresses the biggest shortcoming of the Act: too little funding. Currently, Congress can appropriate no more than $41.5 million for the Fish and Wildlife Service's endangered species program. As Michael Bean of the Environmental Defense Fund testified at the Senate hearing, that's less than the Agriculture Department's Beef Promotion and Research Board will spend this year advertising "Real Food for Real People. H.R. 4045 would increase the funding ceiling for the ESA steadily over the next four years to $100 million.

The Chairman's bill would also amend the Act to improve recovery of species, protection of ecosystems, and enforcement. The basic goal of the ESA is to recover species to the point where they no longer need protection from the Act. Recovery plans outline the actions necessary to stop a species decline, and ultimately, to recover it. But, although the ESA already requires recovery plans for listed species, nearly half of the species now on the list are without them. The Endangered Species Act Amendments of 1992 require that the Fish and Wildlife Service develop recovery plans by 1996 for all species now listed. For species listed in the future, recovery plans must be completed within two years of listing.

Amendments contained in H.R. 4045 would more clearly focus the Act on ecosystems. The bill calls for the development of integrated multi-species recovery plans for maintaining and restoring ecosystems or ecological communities. It would also increase funding for the development of Habitat Conservation Plans, an important tool for balancing development activities on private lands with the conservation needs of endangered species. In both cases, priority would be given to plans that cover more than one endangered species and that anticipate the needs of candidates for the endangered species list.

Citizen enforcement of the ESA has been crucial in saving certain species when the government failed to act. The Act's enforcement provisions are limited by the requirement that 60 days advance notice be given before lawsuits are filed. This notice is required even when a violation of the Act could cause a species to be driven to extinction. The ESA Amendments proposed in H.R. 4045 would allow citizens to file suit immediately in emergencies to halt actions that pose a significant risk to endangered species.

As with amendments to weaken the Act, not all strengthening amendments have made their way into bills before Congress. The Endangered Species Coalition, a working group of national and local environmental and animal welfare organizations and professional scientific societies committed to a strong Endangered Species Act, has developed a list of specific improvements that would increase the Act's effectiveness in conserving threatened and endangered species. In addition to supporting Chairman Studds' amendments, The Endangered Species Coalition has called for, among other things, expediting the listing process, strengthening the relationship between species recovery and critical habitat designation, improving the Act's enforcement abroad, and eliminating non-conservation uses of captive endangered species.

Riding Fences

Perhaps the most crucial amendments in this showdown over the ESA will come from those who, like the Administration, try to straddle the fence. The Senate testimony of John Turner, Director of the Fish and Wildlife Service, contained mighty fine words, but an ominous agenda:

"The Administration believes the Act is an essential tool for the conservation for our imperiled natural heritage... Although at this time we are not suggesting specific amendments, we are aware that the Act has been amended before... While the Administration supports reauthorization, it believes that a complete review of the Act is necessary before it can make any specific recommendations. This review is underway at both the bureau and the Department levels."

Under questioning, Director Turner discussed possible changes to the Act. He endorsed a more stringent process for allowing citizens to petition to have a species listed. Such an amendment may be unnecessary, however. The Fish and Wildlife Service is now developing new petitioning rules it plans to implement without changes to the Act. The Director did not support adding economic criteria to the listing process, but he made clear that he was speaking only for himself, not for the Secretary of the Interior or the Administration. Indeed, Secretary of the Interior Lujan is now preparing a plan for the northern spotted owl that would specifically violate the ESA. He has on several occasions questioned the Act's protection for subspecies.

No one would mistake the American Farm Bureau Federation for a friend of the ESA. The Act is clearly a burr under the Farm Bureau's saddle. In testimony for the Senate hearing, the Farm Bureau deemed the Act a failure and called for it to be completely overhauled. Yet, it too had mighty fine words about the Act and amendments it proposed do not sound so different from those recommended by some of the Act's supporters. According to its Senate testimony,

"The American Farm Bureau Federation believes that an appropriate balance between the needs of a species and the needs of people can be struck. No one wants to see species become extinct, yet at the same time no one wants to see people lose the capacity to produce food or to be without essential human services."

To help achieve that balance, the Farm Bureau recommends that critical habitat be designated at the time of listing of a species and that it be defined "with specificity and with scientific justification [as] those lands, and only those lands, that are needed for the survival of a species."

The Farm Bureau's recommendation sounds not unlike a suggestion made by conservation biologists Dennis D. Murphy and Barry R. Noon in this space (ESU, [8]12:6). They wrote "that habitat that is critical ought to be a subset of total habitat, a subset defined by special characteristics." It is in the motivations, and thus in the details of the proposed amendments, where the Farm Bureau and the biologists differ. The Farm Bureau seeks certainty about what subset of lands will be subject to restrictions to conserve a species, because it fears that under current law "**all possible** habitat that might be occupied by the species becomes subject to the prohibitions and restrictions of the Act, creating uncertainty in all quarters." The biologists seek certainty in critical habitat designation, but of a different sort. They call for critical habitat that incorporates the concept of population viability and provides for long-term species survival. For Murphy and Noon, "It is imperative to focus our conservation efforts on those habitats that provide for population stability and growth."

Preparing for the Stampede

This round-up of ESA amendments suggests that the upcoming reauthorization may not be so much a showdown as a stampede for change. Opponents of the Act, like the Farm Bureau, will adopt friendly sounding names, use organizing tactics perfected by the environmental community, and even talk about amendments to the Act in language not so different from our own. If the Endangered Species Act is to emerge from this process renewed and strengthened, all of its supporters — scientists, conservationists, lawyers — will have to participate in the development of amendments and then vigorously educate members of Congress, the media, and the public about the differences between the good, the bad, and the unnecessary. In the coming months we must make clear the case that the Endangered Species Act works, it can be improved, and that endangered species conservation is a commitment worth keeping.

Pamela Pride Eaton is Program Director for Refuges and Wildlife at The Wilderness Society, a national conservation organization specializing in federal public lands issues. Pam was the editor of the Endangered Species Technical Bulletin Reprint (now the ESU) in 1986 & 1987.

Bulletin Board

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